DETECTOR INSTALLATION

The following information pertains to installing and removing detectors in PFR housings. Please consult the following instructions for the appropriate detector and heed all warnings to allow proper operation and prevent bodily injury and/or detector damage.

The following symbols may be present on equipment and/or instruction manuals:

Symbol	Publication	Description
	ISO 3864, No. B.3.1	Caution - Refer to Accompanying Documents
	ISO 3864, No. B.3.6	Caution - Risk of Electric Shock
	ISO 417, No. 5019	Protective Conductor Terminal
1	IEC 417, No. 5007	On (Supply)
0	IEC 417, No. 5008	Off (Supply)
	IEC 417, No. 5016	Fuse

⚠ WARNINGS

FAILURE TO ADHERE TO THE FOLLOWING INSTRUCTIONS COULD RESULT IN THE DESTRUCTION OF THE INSTALLED DETECTOR

⚠ BEFORE INSTALLING ANY TUBE OR SOCKET ASSEMBLY, THE WINDOW ASSEMBLY MUST BE REMOVED SO THAT THE FACE OF THE TUBE CAN BE OBSERVED DURING INSTALLATION. THIS IS TO INSURE THAT NOTHING COMES INTO CONTACT WITH THE FACE OF THE TUBE. WHEN THE WINDOW IS REINSTALLED, EXTREME CARE MUST BE TAKEN THAT THE INNER SURFACE OF THE WINDOW OR INWARD PROJECTING LENSES DO NOT COME INTO CONTACT WITH THE FACE OF THE TUBE.

⚠ EXTREME CAUTION MUST BE EXERCISED IN APPLYING HIGH VOLTAGE TO THE DETECTOR. DO NOT UNDER ANY CIRCUMSTANCES EXCEED THE DETECTOR MANUFACTURER'S MAXIMUM RATED VOLTAGE AS INDICATED BY THE SERIALIZED TEST TICKET PROVIDED WITH THE DETECTOR.

⚠ FAILURE TO FOLLOW THESE PROCEDURES VOIDS ALL EXPRESSED AND IMPLIED WARRANTIES, AND COULD RESULT IN DETECTOR DESTRUCTION.

⚠ TO AVOID POSSIBLE SHOCK HAZARDS, TURN OFF ALL POWER (HIGH VOLTAGE, LINE VOLTAGE, ETC.) BEFORE ANY INSTALLATION, REMOVAL OR ADJUSTMENT OF THE SYSTEM OR ANY COMPONENTS.

⚠ REMOVAL OF SOCKET ASSEMBLY (WITH OR WITHOUT DETECTOR)

On air-cooled units, when required, release the snap latches on the fan housing and swing open for access. Return the fan housing to its closed position before operating the chamber.

On all units, remove the three screws which secure the flange of the tube socket assembly to the rear plate of the chamber. Using a slight rotational pull, extract the socket assembly (with detector intact) from the chamber.

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⚠ "O" RING MAINTENANCE

All housings are supplied with properly lubricated "O" Rings to insure that moisture is prevented from entering the housing during operation. Prior to socket assembly or window installation, the window "O" Ring and/or the two socket assembly "O" Rings should be checked and lubricated if necessary. Use a thin coating only of silicone-based "O" Ring lubricant or vacuum grease.

⚠STANDARD PHOTOMULTIPLIER TUBE SOCKET ASSEMBLY

1. ⚠Refer to the WARNINGS at the beginning of the detector installation section.
2. Install PM tube in socket. When used with housings for two inch PMTs, tubes having envelope diameters less than two inches require an adapter sleeve, normally supplied with the socket assembly. Slide this adapter over the tube envelope prior to installing in chamber.
3. Place the socket assembly in the rear opening of the chamber and push the assembly to its maximum forward position. A thin film of "O" Ring lubricant around the forward end of the socket assembly cylinder will greatly ease the installation into the inner "O" Ring. Apply gentle force as necessary.
4. Secure the socket assembly to the chamber by inserting the three screws through the flange on the socket assembly into the tapped holes in the rear plate of the chamber.
5. Replace the window and secure with the threaded window retainer ring, being sure the "O" Ring is in position between the surface of the window and the chamber inner flange. Tighten the retainer ring only sufficiently to compress the "O" Ring and prevent entrance of moisture during operation.

⚠MICROCHANNEL PLATE PHOTOMULTIPLIER

1. ⚠Refer to the WARNINGS at the beginning of the detector installation section.
2. Refer to the Standard Photomultiplier Tube Socket Assembly section for features in common.
3. Install MCP in its socket or gripper ring and connect all leads to associated terminals as shown on the schematic wiring drawing. Due to the inherent high voltage used on these devices, take particular care to prevent loose wire leads from making contact with cooler wall or other leads
4. Place the socket assembly in the rear opening of the chamber, and using a rotating motion, push the assembly to it maximum forward position. A thin film of "O" Ring lubricant around the forward end of the socket assembly cylinder will greatly ease the installation into the inner "O" Ring. Apply gentle force as necessary.
5. Secure the socket assembly to the chamber by inserting the three #8-32 screws through the flange on the socket assembly into the tapped holes in the rear plate of the chamber.
6. If the window was removed, replace and secure with the threaded window retainer ring, being sure the "O" Ring is in position between the surface of the window and the chamber inner flange. Snug the retainer ring only sufficiently to compress the "O" Ring and prevent entrance of moisture.

⚠MICROCHANNEL PLATE IMAGE INTENSIFIERS IN GRIPPING HOLDER

This type device usually installs through the exit window of the cooled chamber.

1. ⚠Refer to the WARNINGS at the beginning of the detector installation section.
2. Remove the chamber exit window and remove the gripping holder from the chamber by pulling gently while rotating slowly.
3. Install the MCP Image Intensifier in the gripping holder inside the housing and push gently in place. Be sure the MCP Image Intensifier is held firmly by the gripping holder before taking your hand away.
4. Using both the schematic wiring drawing and outline assembly drawing make all electrical connections to the MCP intensifier. Dress all wires away from metal chamber parts and away from each other due to high voltage used.
5. Install the rear window with associated "O" Ring in position. Be sure the "O" Ring is lubricated, to insure the hermetic seal.

⚠ADJUSTABLE SOCKET ASSEMBLY

1. ⚠Refer to the WARNINGS at the beginning of the detector installation section.
2. Refer to the installation procedure for the type of detector being used.
3. Rotational adjustment

    A. Loosen the three #8-32 screws which secure the socket assembly to the housing.

    B. The socket can now be rotated for cathode alignment. This can be done while the detector is in operation.

    C. When the desired alignment is achieved, tighten the #8-32 screws.

4. Axial adjustment

    A. Remove the large knurled screw at the rear of the socket assembly. This exposes the detector axial adjustment.

    B. Using the number 10 hex nut driver supplied with the socket assembly, move the detector back and forth along its axis to optimize cathode location. The mechanism is spring-loaded and light-tight, and permits adjustment while the detector is in operation. Some assemblies may require a slight push on the hex nut to assist the spring system when moving the tube forward. The assembly is preset at the factory for the nominal cathode location to minimize adjustment required.

⚠CAUTION

DO NOT OVERTIGHTEN NUT, AS THIS WILL BREAK THE NYLON SCREW AND DESTROY THE ADJUSTING MECHANISM, AND POSSIBLY DAMAGE THE TUBE.

When the adjustment is complete, secure the large screw at the rear of the socket assembly to insure the hermetic seal and RF shielding integrity.

⚠ GRIPPING SOCKET ASSEMBLY FOR PMTs WITHOUT PINS

1. ⚠ Refer to the WARNINGS at the beginning of the detector installation section.
2. Refer to the Standard Photomultiplier Tube Socket Assembly section for features in common.
3. Refer to the schematic for specific instructions relative to individual tube type.
4. Trim tube leads to a suitable length. Feed wires through the tube gripping socket center hole and solder to appropriate terminals.
5. Insert the tube into the gripping socket until it stops against the internal shoulder. View through the 1/8 inch diameter hole to confirm the seated depth of tube. Be sure to maintain proper window orientation if required.
6. The socket assembly and tube are now ready to be installed in the housing.

⚠SOCKET ASSEMBLY FOR THE TE-153

1. ⚠ Refer to the WARNINGS at the beginning of the detector installation section.
2. Unscrew the socket section of the housing from the main cylinder by rotating counterclockwise.
3. Insert the PM tube in the socket and install the electrostatic shield when supplied. See drawing A55839.0490 for information regarding shield assembly to PM tube.
4. Replace the tube socket assembly into the main cylinder and rotate only to a finger tight condition.

⚠VIDICON TUBE

1. ⚠ Refer to the WARNINGS at the beginning of the detector installation section.
2. Refer to the Standard Photomultiplier Tube Socket Assembly section for features in common.
3. Drill three index holes in the rear plastic surface of the deflection yoke to accept rotation plungers in the socket assembly where applicable. Refer to drawing supplied.
4. Install the Vidicon and coil into the chamber. The target lead can be brought outside the chamber via the insulating tube at the front of the chamber. Seal this hole with black RTV to prevent light and moisture from entering the chamber. Solder other leads from the coil and Vidicon to leads provided in the socket assembly, and insulate with shrink tubing. Use heat from a heat gun or carefully use a soldering iron to shrink tubing. Connect appropriate leads to the tube socket.
5. Secure the socket assembly to the chamber by inserting the three #8-32 screws through the flange on the socket assembly into the rear plate of the chamber.
6. Loosen all screws in the Vidicon socket assembly (DO NOT REMOVE SCREWS) and while the system is in operation, rotate the coil for proper alignment. Secure screws when aligned.

⚠SOLID STATE DEVICE VIA WINDOW HOUSING

Certain devices such as Solid State Detectors do not utilize a separate tube socket assembly.

1. ⚠Refer to the WARNINGS at the beginning of the detector installation section.
2. Unscrew the black window retainer from the window housing.
3. Remove the window and "O" Ring from the window housing.
4. Remove the heat shield when supplied.
5. Install the device in the socket provided.
6. Replace the heat shields if supplied.

⚠NOTE
THE HEAT SHIELD MUST NOT TOUCH THE DEVICE AS THIS MIGHT RESULT IN PERMANENT DAMAGE TO THE DEVICE

7. Lubricate the "O" Ring if necessary and replace it in the window housing in the groove provided.
8. Replace the window on top of the "O" Ring.
9. Screw the window retainer into the window housing until finger tight. Do not overtighten.

⚠SOCKET SCHEMATIC INFORMATION

The following pages show some of the more commonly used photomultiplier tube socket assembly schematic references. If a different schematic applies, it is substituted in this manual as a separate sheet.

To determine which reference applies, refer to the socket assembly label. The listing is (tube or device type/schematic number/wiring number). The schematic reference is either the entire schematic number (e.g. 23456.0010), or the schematic number preceded by SCH820.

REPLACEMENT SOCKET ASSEMBLIES

In the event it is desired to order a replacement socket assembly, the order must refer to all of the numbers on the socket assembly label. This includes the serial number and the tube or Device type/Schematic number/Wiring number, as well as any additional reference numbers or letters that may be included.

⚠⚠TROUBLESHOOTING

NOTE: the following instructions pertain to “typical” socket assemblies. Non-standard wiring, including grounded-cathode configurations, may be different. Always consult the schematic before proceeding.

The socket assembly can usually be tested for proper resistances, voltages, and (if possible) leakage current, according to the following guidelines:

RESISTANCE - Remove the detector and all cables from socket assembly.

Check the following:
- 10 Megohms from the cathode pin to the shield contact (brass button) on the side of the socket assembly (if applicable).
- 33 Kohms from the center of MHV connector to the cathode pin.
- Short circuit from the center of the BNC connector to the anode pin.
- Resistor values between the appropriate pins, as indicated by Schematic 820.xxxx, ending with the last dynode pin to ground.
- Open circuit from the center of the BNC connector (anode) to ground.

VOLTAGE - When measuring voltages, remove the detector, install the High Voltage cable into the MHV (cathode), and leave the BNC (anode) disconnected.

⚠CAUTION
BE AWARE OF THE PRESENCE OF HIGH VOLTAGE, ESPECIALLY AT THE SHIELD CONTACT (BRASS BUTTON OR PLUG) AND ON THE SOCKET PINS.

Measure the following:
- No voltage between anode pin and ground.
- Appropriate voltages between all dynode pins per voltage divider calculation (divide each resistor into the sum total of all resistors, then multiply by the applied voltage)

LEAKAGE CURRENT - When measuring leakage current, remove the detector, install the High Voltage cable into the MHV (cathode), and connect the BNC (anode) to a picoammeter.

⚠CAUTION
BE AWARE OF THE PRESENCE OF HIGH VOLTAGE, ESPECIALLY AT THE SHIELD CONTACT (BRASS BUTTON OR PLUG) AND ON THE SOCKET PINS. ALSO, BE SURE THE DETECTOR IS REMOVED.

Leakage current into the picoammeter should be less than 5pA.

Please direct all other inquiries to PFR Technologies for Technical Assistance.